

(Problem 1-3)

Solution to Problem 5-4 (1-3)



Let: ϵ_k be the extent of Reaction k
 n_i^0 be the initial moles of Species i
 n_i be the moles of Species i after 10 hr.
 ν_{ki} be the stoichiometric coefficient of Species i in Reaction k

$$n_i - n_i^0 = \sum_k \nu_{ki} \epsilon_k$$

For quinoline ($\text{C}_9\text{H}_7\text{N}$), denoted "Q":

$$n_Q - n_Q^0 = -(1)\epsilon_1 + (0)\epsilon_2 + (0)\epsilon_3 = -\epsilon_1$$

$$40 - 100 = -\epsilon_1 \Rightarrow \boxed{\epsilon_1 = 60}$$

For decahydroquinoline ($\text{C}_9\text{H}_{17}\text{N}$), denoted "DHQ":

$$20 - 0 = (0)\epsilon_1 + (0)\epsilon_2 + (1)\epsilon_3 \Rightarrow \boxed{\epsilon_3 = 20}$$

For hydrogen, denoted "H":

$$290 - 500 = (-2)\epsilon_1 + (-1)\epsilon_2 + (-3)\epsilon_3$$

$$-210 = (-2)60 - \epsilon_2 - 3(20) = -180 - \epsilon_2$$

$$\boxed{\epsilon_2 = 30}$$

For tetrahydroquinoline ($C_9H_{11}N$), denoted "THQ":

$$n_{\text{THQ}} - n_{\text{THQ}}^{\circ} = (1)\epsilon_1 + (-1)\epsilon_2 + (-1)\epsilon_3$$

$$n_{\text{THQ}} = 60 - 30 - 20 = 10$$

$$\boxed{n_{\text{THQ}} = 10 \text{ mols}}$$

For butylbenzylamine ($C_9H_{13}N$), denoted "BBA":

$$n_{\text{BBA}} - n_{\text{BBA}}^{\circ} = (0)\epsilon_1 + (1)\epsilon_2 + (0)\epsilon_3 = \epsilon_2$$

$$\boxed{n_{\text{BBA}} = 30 \text{ mols}}$$